In the matter of
United States Patent
Application no.
10/509,098

STATUTORY DECLARATION

I, Nicolaas Laurisse Sieling, of Murray-Gwynne Farm, The Coach Road, Mulwala, in the state of New South Wales, Australia, farmer and agricultural contractor, do solemnly and sincerely declare that:

1.
Since 1978 I have made my living continuously as a dairy farmer and agricultural contractor, initially in New Zealand and, since 1996, in Australia. With my wife, I currently own a 600 hectare farm ("my farm") in Mulwala. The farm is operated through a company, Rotacon Engineering Pty Ltd, of which I am managing director and principle shareholder.

2.
I believe it true to say that my farm, in common with most farms in Australia and New Zealand, is highly mechanised. We use the equipment that is normally used in the course of virtually all dairy farming operations. I believe in keeping such equipment up to date and, because I have done so, I believe that I have a good knowledge of the equipment that is currently commercially available.

3.
Much of the equipment on my farm is used only for specialised jobs and stands idle a lot of the time. I believe it true to say that this is the experience of most farmers. For this reason, in order to make greater use of the equipment, I have from the outset carried on an agricultural contracting business in conjunction with each farm that I have operated. As a contractor, I have carried out all jobs normally associated with such businesses, including land levelling. Because of these activities, as both a farmer and a contractor, I believe that I am well aware of the good points and shortcomings of the equipment that I have used, especially as, much

of the time, I have personally operated the equipment. The earthmoving machines that I have operated (and still operate) include front end loaders, tractor-towed farm graders, back actors, manual- and laser-controlled bucket levellers (scrapers), and of course the ground leveller ("my leveller") that is the subject of my US application serial no. 10/509,098 ("my application"). Apart from the latter, I designed and built both of the manual- and laser-controlled bucket levellers that I currently use.

4.

I am the applicant for this US patent application no. 10/509,098. I have been inventing things since I was a child. Before I became a farmer, I set up a business that I operated through a company, Rotacon Engineering Limited, aimed at finding inventive or at least innovative solutions to industrial problems in general. Although we did have some technical success, the business was not profitable enough and I closed it down in 1989. After that time I began to concentrate seriously on making improvements to the equipment that I was using in my farming and contracting operations. Since then I have built a great many machines incorporating such improvements and I have applied for patents for many of them.

5.

Ground levelling is one of the common jobs that I have had to do in both my farming and contracting operations. I have also had some experience in building farm roads and maintaining them. For present purposes, however, I will concentrate on the levelling of ground used for growing crops, including pasture.

6.

I have read the declaration that has been made by Bruce Archibald Short ("Mr Short") in this matter. Insofar as he deals with matters that relate to levelling that are within my experience, I do not think it necessary to repeat what he has said as I agree unreservedly with it. However, I believe that it is worth discussing certain aspects of field levelling as it relates to the growing of crops.

7

Field levelling is a bit different from grading a road. Land for growing crops must of course

be prepared before it is levelled. No land is naturally level. There are high and low places in all land, even if it might appear to the eye to be level. There are thus two possible phases to field levelling. First, it is nowadays necessary, for optimum efficiency, to smooth out these natural rises and falls in the general level of the land. This is especially necessary where the land is irrigated but in any case typically requires soil to be moved from one place to another in a field. For this purpose, a scraper is used for transporting quantities of soil of any significance.

8.

Whether this first phase of field levelling has been necessary or not, small undulations in the soil surface must be removed. These undulations may occur naturally or as a result of the land being broken up by ripping, ploughing or tilling which inevitably leaves the surface in a rough state typically made up of uniformly spaced furrows or randomly distributed clods of varying size. In any case there are countless undulations in the surface that are subsequently traversed by the levelling apparatus. The size of such small undulations that a machine can effectively deal with is determined by the design of the machine. Undulations that extend transversely to the direction of motion of the machine are dealt with by using a straight blade that is mounted at 90° to the direction of motion. The longer this blade is the better but, in field levelling, it is also necessary to diminish, as far as possible, the tendency of the blade to sway in such a way that one end of the blade from rises or falls relative to the other. This tendency would be greatest where a long blade is mounted on a prime mover such as a front end loader having a relatively narrow wheel base and the blade is mounted in such a way that, if the prime mover sways sideways, this movement is transmitted to the blade. To reduce this tendency, on levelling machines such as tractor towed farm grader blades and other field levellers that I have seen, the blade and its supporting structure (what is called the "carrier" in my US application) are mounted so as to be able to 'float' independently of the tractor. In the conventional field levellers that I have seen, ground wheels are mounted at or near the ends of the carrier. The ground wheels not only reduce the tendency of the carrier to sway in the way that I have described but also support the weight of the carrier and help to reduce the tendency of the blade to dig in as the machine moves forward. One disadvantage of ground wheels, especially when used on large, heavy equipment, is that they tend to leave track marks which are significant having regard to the very fine levelling of which my field

levellers are capable.

9.

Small undulations that occur in the direction of motion of the machine are dealt with differently. Again, it is necessary to diminish, as far as possible, the tendency of the blade to rise and fall unwantedly as the apparatus moves forward. This tendency would be most marked where the blade is suspended from the ends of the arms that hang out the back of a prime mover such as a front end loader having a short wheelbase. Any backwards or forwards swaying of the prime mover as it moves over undulations in the ground would be magnified and transmitted to the blade. It is to diminish this tendency that a motor grader for road building has a long wheel base and its blade is mounted between the back and front wheels. Again, this tendency is diminished in a tractor towed farm grader or conventional field levellers by mounting the blade and its carrier on a supporting frame that can 'float' independently of the tractor. The supporting frame is supported on wheels and the conventional approach is to use a long frame so that the blade is a long way behind and/or in front of the wheels.

10.

For the very fine degree of field levelling that is nowadays becoming the norm, especially in laser levelling, it is absolutely necessary in addition to provide for moment to moment adjustment of the blade height relative to the ground.

11.

Before I developed the concept of my field leveller, I used a commercially available field leveller produced in Australia by KB Engineering, the company that now produces my leveller under licence. The KB machine comprises a blade mounted on a carrier, 12 meters long. It is supported at each end by a pair of wheels, mounted on the carrier and located in front of the blade. A drawbar is rigidly connected to the carrier and, at its front end, is hitched to the tractor. The moment-to-moment height of the carrier above the soil surface is controlled by hydraulic rams mounted between the structures that carry the wheels and the carrier. This leveller has several good features. The carrier is a rigid, one piece welded triangular box section. A set of wheels folds down under the action of a hydraulic ram for transport. However, the machine also has several disadvantages which I found out by

experience. I believe that the wheels are mounted in front of the blade in order to reduce track marks left by the wheels. However, I found that this makes the blade height hard to control and another real problem this is that the blade tends to jump up when the wheels hit a hard clod in the soil. Another disadvantage of the KB leveller is that the drawbar must be manually folded for transport.

12.

Another machine that I owned before I developed my field leveller is a tractor towed farm grader blade. I still use this machine for grading the roads on my farm. Two pictures of the machine are annexed hereto as Annexure a. In common with other such grader blades, it comprises a blade mounted on a beam rigidly suspended from the three point linkage. When I bought this machine, it was provided with a single wheel that was located about 100 cm behind the blade and on which the blade was supported. There was no provision for preventing sideways rocking of the blade which is not as important in road grading as in field levelling. In order to improve the grading performance of this machine, I removed the wheel and, behind the blade, I mounted a horizontal plate about 20 cm wide and 2 meters long. The front (long) edge of the plate is hinged to the back of the blade, near the lower edge thereof. An upstanding lever arm is welded to the centre of the plate and a small hydraulic ram is mounted between the back of the blade and the upper end of the lever arm. The ram can be used to hinge the plate up or down. In use, the weight of the blade is supported on the plate which skids over the ground. The blade can be raised or lowered by hinging the plate up or down. I should perhaps stress that my intention in using the plate was to help the blade take up the right position on the ground, especially allowing for camber in the road surface and when the blade is set at an angle to the direction of motion. I should also mention that I have used the modified farm grader blade only for building and maintaining the roads on my own farm; i.e. I have not it in my contracting operations or in any other public way.

13.

In addition to the two machines that I have just described, I have owned and operated several front end loaders. I was aware that some earth moving machines such as scrapers have a cutting edge that is mounted at the front of and flush (or very close to flush) with a floor which often, in practice, bears on the ground. Similarly, the buckets of nearly all

front end loaders have a flat floor the front edge of which carries a cutting edge that is flush with the floor. In some operations, the flat floor of the bucket is brought down flush with the ground and the machine driven forward, for example to scoop up earth. I have frequently observed, and I believe that it would be common knowledge amongst experienced operators, that the bucket has a rough levelling action on the ground over which it slides and digging in of the cutting edge tends to be prevented by the contact of the floor with the ground.

This digging in of the bucket would be a fatal drawback to using a front end loader for fine levelling. It's caused by the fact that, as the loader moves over the ground, it traverses high and low spots in the ground which tend to lift or lower the front wheels relative to the back wheels. This movement is translated to the bucket and is in fact magnified in proportion to the distance between the wheels and the bucket. The operator compensates for this by actuating the lift ram(s) to lift or lower the bucket. But this compensation is approximate at best and a job that can only be described as rough.

Independently of the above, I know that one end of the bucket or the other has a tendency to dig into the ground when the loader tilts from side to side as it moves over rough terrain. The way in which the bucket is connected to the loader renders it impossible to stop this from happening. Mr Short explains the reasons for this in his declaration and, because I agree with it, I don't think it necessary to repeat what he has said.

14.

When I first began to contemplate building a field leveller, I started by thinking of how to improve the KB leveller that I was using. I focussed on improving the fineness of the levelling and my initial thinking naturally centred on the unevenness contributed by the wheel arrangement. I was aware that many agricultural machines are provided with multiple wheels for various reasons and I considered the implications of mounting a larger number of ground wheels along the carrier of a leveller to spread the weight. I realised that it would be an advantage in practice to mount the wheels relatively closely behind the carrier to reduce the up and down movement translated to the carrier from the tractor. I also realised however, that the use of many wheels would have disadvantages. First, it would add significantly to the cost. Second, it would severely complicate arrangements for folding the

leveller for transport.

15.

Notwithstanding my experience of the three machines that I have just described I cannot now recall how long it took me to realise that there might be some advantage in mounting the cutting edge of a field leveller on a carrier that skids over the ground. I can only speculate about this in hindsight but I do remember that it took quite a long time.. What is certain is that I knew the levelling quality of the KB leveller was detrimentally affected by the fact that the blade is mounted on wheels. It never occurred to me to use the farm grader blade for field levelling, even after I had fitted it with the skid plate as I have described above. It would not be big enough for this purpose and it would not be possible to hang a big field leveller off the 3 point linkage as is done with the farm grader blade. In any case, I know from my experience in using it that the quality of levelling of which the farm grader blade is capable is too rough to make it suitable for field levelling.

16.

It also would not have occurred to me to use the loader bucket for field levelling. It would be impossible to control the height of the bucket (above the ground) accurately enough to achieve anything but a very rough job. And, just as important, I can think of no way of stopping the bucket ends from digging in.

17.

In summary, I want to stress that, having regard to the background knowledge that I had at the time that I first thought of building a leveller, none of the machines that I have described and that I had worked with, apart from the KB leveller, would have been suitable for use as a field leveller. And it is precisely the limitations of the KB leveller that set me on the path of developing my leveller.

18.

I was not at that time aware of the designs suggested in US patents 4521980 and 4809449, both in the name of Solaja. In my opinion, with the benefit of hindsight, these designs in a similar sense duplicate the levelling action of the loader bucket that I have described above.

However, I believe that, if I had seen the Solaja designs when I first started to contemplate designing a leveller, having regard to my experience of the machines that I had actually worked with, I would almost certainly have rejected the idea because I believe that his design would be no more suitable for use as a leveller than a loader bucket used in the way that I have just described, even if I had realised that his apparatus could be used with the pipe (i.e. his "carrier") dragging over the ground instead of the bucket floor. I would have believed, and still think, that the results would be too rough for field levelling. Far from overcoming the digging in of the blade, particularly at its ends, using Solaja's arrangement with a longer pipe would have made it worse. I agree with what Mr Short has said in his declaration in the regard and see no reason to repeat it here.

19.

When I first started to think about building a field leveller, from my experience with the KB leveller, I was aware of the disadvantages of using wheels and hydraulic rams to provide for moment to moment adjustment of the blade height relative to the ground. I have referred to some of them. In addition, wheels increase the complexity and bulkiness of the machine since the wheels must generally be positioned at some distance from the blade or other ground working tools for fine control. And hydraulic systems, while very convenient, increase the cost of a machine. So, possibly as a result of the knowledge that I developed in working with my modified grader blade, at some point it occurred to me to mount the blade for my leveller on a rigid carrier that rested over its entire length on the ground since this might overcome the problem of the digging in of the blade ends. The carrier would be as long as the blade and would skid over the ground. It took me a while to think of using a pipe for the carrier since I had in mind the construction of the carrier of the KB leveller. And once having got to that point, I realised that very fine blade height control could be achieved by positioning the blade close to the point where the carrier bears on the ground and providing a long drawbar connected to the plough arms. The moment-to-moment height of the blade could be controlled by the plough arms. This in turn would very much simplify folding the carrier for transport and the whole machine would be simpler and inexpensive to construct.

20.

The first prototype of my leveller had a 12 meter long pipe to which the cutting edge was attached. Unfortunately I don't have any photographs of it as I modified it to build my second prototype. The first prototype also had a rigid drawbar that was connected at its front ends, through a hitch bar, to the plough arms of the three point hitch. The pipe was thus free to pivot from side to side and was arranged to float on the ground. At its back end, the drawbar was connected to the pipe so that the drawbar could hinge about a vertical axis to the folded position. I provided chains connected between the pipe and either side of the drawbar to hold the pipe at 90° to the drawbar in use. However, I had to manually disconnect one of the chains and fold the drawbar against the pipe for transport.

21.

For various reasons, including the cost, it is particularly important that field levellers, particularly the large field levellers that are nowadays in use should operate efficiently. This means that the tendency of the ends of the carrier to sway up and down should be minimised and also that any tracks left in the ground, for example by ground wheels or the ends of the blades, should be eliminated. Not only is it costly to have to make more than one pass over a given swath of land but any highs and lows left in the land surface by the leveller reduce can affect the productivity of the land very significantly. The concept that my leveller has achieved is to maintain a bank of dirt ahead of the blade and over the full length of the blade. This bank has an optimum average height of, for example, 20 cm. This requires very fine moment-to-moment control. The level of control that my leveller achieves can be illustrated quantitatively by an example. If the blade starts to accumulate too much dirt so that the height of the bank increases by as little as 5 cm, the tractor that I use starts to labour and slow down. To correct this I typically lift the plough arms, and hence the front end of the drawbar, by about 5 cm. This means that the blade is lifted by about 1.5 mm. In my experience of using the leveller, in these circumstances, the tractor will move forward about 200 meters before it gets back up to speed. The point is that none of the machines that I have worked with, as described above, are capable of anything like such fine moment to moment adjustment. And I don't believe that the Solaja machine would be either. The way that any of these machines, including Solaja's, would cope with the blade digging in to the extent that the forward speed of the machine is slowed down, is to lift the blade. None of these machines would be able to lift the blade by as little as 1.5 mm in a controlled way.

24.

US Patent no. 3751071 (Patterson) discloses a ploughing machine and this patent also does not describe the ground engaging tools (plough shares) in detail. It is clear however that Patterson's apparatus is similar to conventional equipment of this kind in that, while the apparatus rides on wheels that follow the ground contour, the banks of plough shares would find their own level. This level would be determined by the angle at which the beam 12 (and hence the shares themselves) is set to the direction of travel. This angle is determined by the degree of off set of the rear wheel of the apparatus.

25.

US Patent no. 4582143 (Pratt) discloses a similarly arranged planting machine comprising two banks of tools that ride on wheels.

26.

There is no provision in Hundeby, Patterson, Van der Lely or Pratt for controlled, moment-to-moment adjustment of the working height of the tools. In line with the commercially available machines of this kind that I am familiar with, there is no call for this in such machines. The only references that disclose such adjustment are US 4236586 (Solaja) and US 4236587 (Shader) both of which disclose levelling machines.

27.

What I have tried to show in this declaration is that I have quite a lot of knowledge of earth moving machines, including levellers, and experience in using them. I am also motivated to solve problems. One or other of the machines that I have used had features that are very similar if not identical to features of the machines disclosed in the references and pointed to in the official action. Notwithstanding all this, it took me quite a lot of time and thought to work out the concept of my leveller. I believe in particular that the Solaja apparatus, mounted as it is on a front end loader, would not be suitable for use as a field leveller and that other experienced people would agree with this. I therefore think it illogical and erroneous to suggest that it would easily occur to others to combine Solaja's apparatus with one or another of the other features shown in the patents referred to in the official action to arrive at my invention.

22.

Bearing in mind that the KB leveller that I described above has a drawbar that is rigidly attached to the carrier and that the carrier is supported on wheels, I believe that the KB leveller is closer to my concept than the machines disclosed in any of the references in the official action. I therefore do not think it necessary to discuss the references in detail.

23.

The Hundeby patent (US 6293352) shows a machine with ground engaging tools that are carried on three separate beams that are collectively supported on wheels 12, 25 (Figures 2 and 6A, Hundeby) and in addition, in larger machines, by wheels 18a. Hundeby does not describe his ground engaging tools (tilling and sowing tools) in detail. However, in the equipment of this kind with which I am familiar, the tilling and sowing tools find their own level. This level would be determined essentially by a ground wheel mounted at the back of each tool. The profile of the tools in Hundeby's Figure 3 suggests such a wheel and an example of this is shown in US patent no. 4049061 (van der Lely) which also discloses a tilling machine in which the level of the tools is determined by the wheels 20.

There is no description in Hundeby of moment-to-moment height adjustment of the ground working tools and it is clear from the described arrangement that this would be inappropriate. The ground working tools are carried on a center beam 16 and wing beams 21 that are joined together by fore-and-aft disposed pins 17. In the working position, the wing beams are supported on the wheels 25 and pivot freely about the pins 17. The wing beams float relative to the center beam and to each other. The center beam is locked to the drawbar and thus rises ands falls with the drawbar which is supported, through a rigidly connected beam 13, on the wheels 12 and, in the larger machines the wheels 18. The heights of Hundeby's tools thus are not affected by changes in the height of the front of the drawbar. On the contrary, in my arrangement, there is a critical and controlled change in the height of the knife edge when the front end of the drawbar is lifted or lowered. This occurs because, unlike Hundeby, and Solaje for that matter, my drawbar is rigidly connected to the carrier.

And I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 28 MAR 06

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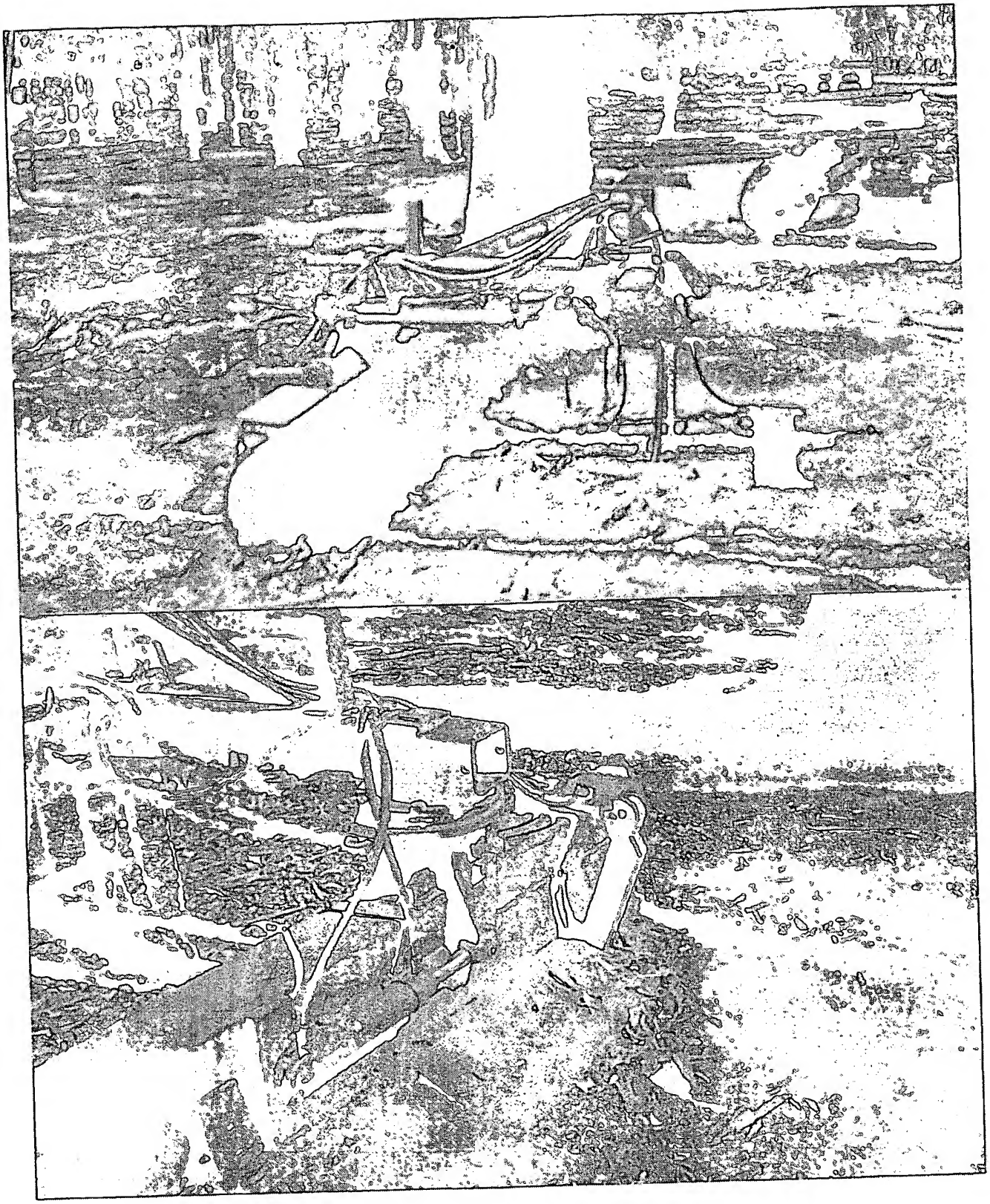
Declarant: Nicolaas Laurisse Sieling



This is the annexure marked "A" referred to in the statutory declaration of Nicolaas Laurisse Sieling.

Dated: 28 MAR 2006

Declarant.....